

**UNIVERSITI TEKNOLOGI MARA  
CAWANGAN PULAU PINANG**

**DESIGN OF PIEZOELECTRIC BASED  
ACOUSTIC TRANSDUCER FOR SONAR  
APPLICATION**

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July 2018

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## **AUTHOR'S DECLARATION**

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## **ABSTRACT**

The acoustic technologies are widely used in the underwater survey especially for sonar system. Sound Navigation and Ranging (SONAR) is a technique that used sound propagation to navigate, communicate with or detect object on or under the surface of water. The methods that can be used in underwater environment to measure the distance of object are acoustic transducer, and ultrasonic transducer (UT). In this project, piezoelectric concept is used to detect an ultrasonic waves and it is more advantages than capacitive (CUT). The aim for this project is to measure the distance from the object to the transducer in underwater. The acoustic transducer is designed with low frequency. Low frequency is applied to get the longer distance measurement. The acoustic transducer with low frequency is designed to measure the distance of the object in underwater environment and it is useful for the sonar application. The design of the acoustic transducer has been simulated and done by Comsol software. The sensitivity for different material has been shown to obtain the highest sensitivity of the different piezoelectric materials. The best piezoelectric material that can provide the highest sensitivity is PZT-5H. For the hardware part, the acoustic transducer is designed with different diameter which are from 5mm to 8mm. The acoustic transducer will be tested in 3 tests which are load test, speaker test and underwater test. For the underwater test, the sensitivity of the transducer are obtained for all the diameter of the transducer. The higher sensitivity of the transducer is occurred at the higher output voltage in underwater test.

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